



ISSD

NEWSLETTER

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A Life History of a *Dendrobates histrionicus* Colony

by Joyce Peterson, Senior Keeper, Reptile House, Brookfield Zoo

A colony of eight *Dendrobates histrionicus* arrived at the Brookfield Zoo in October of 1976. Of these, five died within a month.

The three surviving frogs lived together as a colony off exhibit. They were housed in a fifteen gallon aquarium tank. The tank was kept at a 45° angle in an angle-iron framework to increase the floor space of the cage. This also made service access easier. Pea gravel was used in the bottom for drainage (5 inches or 13 cm deep). A layer of black dirt 1 & 1/2 inches (3.8 cm) was added to this and overlaid with a 1/2 inch (1.25 cm) layer of moss collected from a nearby wood lot. Cover was provided by plastic plants and broken halves of three inch (7.6 cm) in diameter terra cotta flower pots. A continuous moist area was maintained by setting a sponge in a terra cotta saucer. This was rinsed daily. A small terra cotta saucer was used as a water dish. The cage was misted three times a day. A stainless steel mesh top provided ventilation. However, in order to keep the humidity level high, two thirds of the top was covered with plastic sheeting. The cage was illuminated by a clear infra-red heat lamp which served as a heat source for a neighboring cage. Two Vita-Lite bulbs, about eight feet overhead, provided ultraviolet light.

The frogs were fed pinhead-size crickets three times a week, dusted with a Brewers yeast and calcium mix. [one third Brewers yeast and two thirds calcium mix by volume. The calcium mix was one third D-Ca-Fos and two thirds calcium gluconate by weight]. This was used for the first two years, after which ascorbic acid was added. The new formulation consisted of one part ascorbic acid to twenty parts of the previous calcium mix, by weight. Vegetables provided a medium for fruitflies to lay eggs in; the hatching larvae served as food for the frogs. Fresh fruit and vegetables were added to the dish three times per week. The dish was changed and adult fruitflies added to the dish three times per week.

For the most part, the *Dendrobates histrionicus* seemed to stay hidden. When the frogs were visible, it seemed to indicate that the cage needed to be

torn down and cleaned. Possibly they were responding to the build up of toxins or bacteria that was not obvious to us. One time when the cage was inspected, several spiders were found under the plastic leaves and flowerpot hideouts. After a thorough cage cleaning, the frogs resumed their normal routine.

The first of these three frogs died after about two years, eight months. The only indication of a problem was that it had been observed near or in the water dish for the previous few days.

The remaining two frogs continued to do well in spite of the fact that each one had only one functional eye. One of the frogs arrived in that condition. The other was noted to have a sunken left eye after about two years. The cause was unknown.

The second frog died after being in the collection just under four years. It was euthanized after developing an ataxic condition that grew worse over the span of a week. It was initially observed resting with its forelegs extended in an unusual position. When gently prodded, it would jump and land on its back. A few days later, the forelegs began to look worse. One leg had a wrinkled appearance which improved a little when a few drops of water were sprinkled on it. The frog was euthanized when it was found on its back unresponsive.

The last remaining frog developed a change in the texture and color of its skin about a year later. In spite of the same misting schedule, the skin looked drier and rougher in texture. Over the next few months, the frog grew darker and its yellow spots faded.

Status remained quo with this individual over the next three and a half years.. Then a cataract began to develop in its only eye. After three weeks it was apparent, from weight loss, that its reduced eyesight was inhibiting feeding. The frog was taken for examination and surgery to Sam Vainisi, D.V.M., a veterinary ophthalmologist at Berwyn Animal Hospital. It was anesthetized using MS-222 [tricaine methanesulfonate; Finguel, Ayerst Laboratories] an absorbable anesthetic added to water. The frog was placed in a basin with a 0.1% solution. This only slowed the frog down. The strength of the solution was increased to 0.5% and the frog went down in about five minutes. Dr. Vainisi made an incision above and forward of the lens, making a 20° incision laterally and posteriorly. The lens was about 1 mm in diameter, spherical and very hard. The vitreous humor was very viscous and the lens would not drop into the bottom of the eye. The lens could not be collapsed either. Dr. Vainisi was able

to scoop out the lens and remove it. The incision was closed with four sutures. The frog was placed in a shallow basin and rinsed with water, changed frequently, to recover from the anesthetic. Two hours and twenty minutes after the induction of anesthesia the frog was back in the reptile house and beginning to show signs of recovery. About an hour after that it was able to move about on its own. Unfortunately though, it was found dead the next morning. It had been in the collection a little over nine years when it died.

Acknowledgements:

Ray Pawley for reviewing the article and collecting data.

Terrie Blueman, Geri Radaszewski, Nolan Robinson, Laurie Morgan, Lynn O'Conner and Michele Burbridge for taking care of the colony and collecting data.

Sam Vainisi, D.V.M. for performing the surgical procedure.

Brian Joseph, D.V.M. and Cindy Roach, D.V.M. for technical assistance.

In the beginning we knew very little, and understood even less. Our great enthusiasm caused us to push forward with abandon. We learned much, and increased our understanding not a little. In due time we thought it proper to share our expertise, so we endeavored to publish our work. To our dismay, we discovered that the keeping of records had not been pursued with as much enthusiasm as the rest of our work. In fact, the log was in such a state of chaos as to be relatively worthless. Now we looked this all over very carefully and could come to none but the sad conclusion that what we really had was a lot of nothing! This was particularly troublesome in that some of the things which we had done could be repeated only with great difficulty, if at all. So in the end we could not but repeat what we had stated in the beginning; we knew very little, and understood even less. What a pity!

Lesli Bennington (1932)

"The Breeder's Forum"

Comment on feeding ants to frogs -
March 1989 issue:

Our *Dendrobates auratus* have been observed eating sugar of pharaoh ants (*Monomorium pharaonis*). The ants have not attacked the frogs. However, they have attacked our mealworm, cricket and fruitfly cultures, and some of our reptiles. If you have animals in your collection for which you raise these insects as a food source, you may want to think carefully before bringing these ants into your home or office.

A queen and worker ants establish new colonies by transporting eggs to a nearby location (as per Dan Summers of the Field Museum of Natural History). The colonies are interconnected by scent trails, it is very difficult to trace back to a nest to destroy it. There can be hundreds of nests and they can establish a nest in any narrow space.

We have seen the ants chew holes in the soft epithelial tissue between the scutes of a tortoise and eat away in an open wound on a Boa Constrictor. They have built nests in the cracks of the walls, in between the animal's food dishes and in the papers of our files. We have to keep all our

food on tables protected by ant barriers or in the refrigerator.

We use two types of ant barriers in our building, water and petroleum jelly (vaseline). Our fruitfly cultures are kept in jars which are set in pans of water. We use petroleum jelly to protect our baby cricket tanks, mealworm cultures, kitchen tables, and some small exhibit cages containing giant roaches, scorpions, and tarantula.

The petroleum jelly is applied around the outside of the aquarium tanks in a 1/2 inch (approximately 1.25 cm) band completely encircling the tank. The seams of the tank must be sealed well or the ants will enter through them. A ring of petroleum jelly can be put around each leg of a table; as an alternative, the legs of the table can be put in pans of water. In this way you can isolate things which you do not want the ants to get to, or if you are feeding the ants to your animals you can isolate the ants from your other cages. Care must be taken to observe any "bridges" that the ants can use to cross the barriers. Do not lean anything against a cage or table as this will result in a bridge. The ants have even been known to use spider webs as bridges.

The drawback to using water barriers is that they must be inspected

daily for evaporation. The petroleum jelly lasts longer but can be messy.

For a non-toxic ant poison that we can put directly into the cages in a small vial with perforated lids we use a mixture of boric acid and mint apple-jelly. (two tablespoons of boric acid mixed in a 10 ounce jar of mint apple-jelly). It can also be put on jar lids and even on masking tape in exposed areas.

I strongly suggest that before you utilize ants as a food source you learn something of their life cycle and a way to control them! Also, whether they are harmful to your animals.

We feed our *D. auratus* pinhead size crickets six days a week. The crickets are dusted each time with a mixture of one third Brewers yeast and two thirds calcium mix by volume. The calcium mix is one part Di-calcium phosphate and two parts calcium gluconate by weight. Ascorbic acid is then added to this calcium mix in a proportion of one part ascorbic acid to twenty parts calcium mix by weight. On three of these days we also add powdered zinc to the crickets. On the seventh day we add adult fruit flies to the cage. We keep a small dish of fruit and vegetables in the cage all the time for the fruitflys to lay eggs on. This is changed every week on the day we add the adults. The

frogs then eat the larvae off the vegetables.

These comments for the "Breeders Forum" were submitted by Joyce Peterson of the Brookfield Zoo, Chicago, Illinois.



As it regards "Breeder's Forum", Volume II (2):3: Jack Frenkel's observation of tadpole mortality occurring within several hours after the placement of tadpoles into the cups of the bromeliad *Aechmea fasciata* have brought several things to mind. Obviously some incompatibility must exist in the water of the cup or else the frog larvae would not be dying off. *Ae. fasciata*, the Urn Plant, originates from Brazil where it grows in trees as an epiphyte. The sharp serrated lateral margins of the leaves act as deterrents to large herbivores (ie. vertebrates). I would not discount the possibility that phytotoxins may also be produced by the plant in response to insect feeding, such poisons may be released into the cup on a regular basis or their release may be stimulated by the cell wall damage that results from the action of the rasping mouthparts of the tadpoles as they search for rotifers or algae. Transpiration or other metabolic

processes could also render the pH of the cup incompatible to dendrobatid larvae. Another point to be discussed is the fact that this plant is the most commercially important bromeliad in the floral industry. Growers producing the Urn Plant are apt to treat their plants with pesticides either as aromatic sprays or as time released systemic compounds. In addition, ethylene gas (C_2H_4), applied directly to the plants, or produced by dissolving calcium carbide (CaC_2) in the cups prior to marketing, is used to promote simultaneous blooming of the plants, thus maximizing profits for the grower. Such treatments may strongly influence the microhabitat of the cups. Dr. Frenkel suggests that it may be a plant toxin which is the culprit, I tend to agree with him, however we will not know for sure until the matter is followed up.

Respectfully submitted;

Bill Perriera

Editor's comment: After the plants bloom, new plants (called "pups") are produced around the base of the parent plant. The parent plant usually dies

and there are often two, occasionally three pups produced. Growing these pups to mature plants will result in the elimination of the ethylene gas and pesticide factors. I also suggest that simply aspirating the water from the cups and then using it on eggs in a petri dish might be informative.

Encounter

And when, upon some showery day,
Into a path or public way
A frog leaps out from bordering grass,
Startling the timid as they pass,
Do you observe him, and endeavour
To take the intruder into favour;
Learning from him to find a reason
For a light heart in a dull season.
And you may love him in the pool,
That is for him a happy school,
In which he swims as taught by nature,
Fit pattern for a human creature,
Glancing amid the water bright,
And sending upward sparkling light.

- William Wordsworth

Life

A tree frog clinging
to a banana leaf -
and swinging, swinging

- Kikaku

Second Annual ISSD Meeting - Report

On June 22nd, 1989, the second annual meeting of the **ISSD** was held in Phoenix, Arizona at the 13th International Herpetological Symposium on Captive Propagation and Husbandry of Amphibians and Reptiles.

ISSD President David Hulmes opened the meeting. The minutes of the June 18th, 1988 meeting were read and approved. Secretary - Treasurer Ed Tunstall presented a detailed accounting of the **ISSD** finances of the past year and reported a balance of \$721.00.

A "Travel-Fund" grant of \$200.00 was awarded to **ISSD** member Erik Wevers to help defray the expenses of his trip from Holland to the 13th IHS in Phoenix where he presented a paper entitled Keeping and Breeding *Dendrobates azureus* and Some Other Dart-Frogs in Europe. This paper was presented at a general assembly of the IHS participants. It was very well received and numerous IHS participants were heard to compliment Erik, stating that his informative and humorous talk, as well as the excellent slide presentation, was the highlight of the Symposium.

New membership categories were discussed and accepted as follows:

Contributing Member - \$40.00

Institutional Member - \$50.00

Responsibility for contacting appropriate institutions for purposes of solicitation of new memberships in this category was assumed by Chris Palmer. Institutional Membership applications will be sent to Museums as well as all U.S. (and some European) Zoos with reptile and amphibian collections.

The **ISSD** Board approved two new committee positions and the following chairpersons were appointed: Membership Committee - Chris Palmer, Fund-Raising Committee - Sam Gonzalez.

The first order of business addressed by the Fund-Raising Committee was the production and marketing of an **ISSD** T-shirt. A design submitted by Sam Gonzalez was approved pending a feasibility study of the art work. Planned completion date of the T-shirts is October 1989. This is so that the T-shirts can

be ready for the Midwest Herpetological Symposium which will be held this year in St. Louis. The possibility of an **ISSD** lapel pin is also being explored.

Nominations for the election of **ISSD** officers for 1990 were entertained. The following names were submitted:

President - Dale Bertram

Secretary/Treasurer - Ed Tunstall

As of this writing, these nominations are unopposed. However, anyone wishing to nominate either himself, or any other member in good standing, may do so by writing to Ed Tunstall. The remainder of the offices have two year terms and will not be open for elections until next year. They include: Director-North American Affairs (Anthony Wisnieski), Director-European Affairs (Helmut Zimmermann), and Director-at-Large (Erik Wevers). Scott Solar was appointed to the position of Society Newsletter Editor. His duties will commence with the January 1990 issue (Volume 3, #1).

The meeting was adjourned with the presentation of commemorative plaques to the charter officers honoring their efforts in the founding and establishment of **ISSD**. Those present who received award plaques included David Hulmes (first **ISSD** President), Erik Wevers (First Director-at-Large), Dale Bertram (**ISSD** Founder and First Newsletter Editor), and Ed Tunstall (First Secretary/Treasurer). Plaques for those officers not in attendance at the meeting were displayed and will be shipped to them in the near future. These include Anthony Wisnieski (First Director-North American Affairs) and Helmut Zimmermann (First Director-European Affairs).

Respectfully submitted:

Ed Oshaben

Addendum: A videotape of Erik Wever's presentation, Keeping and Breeding *Dendrobates azureus* and Some Other Dart-Frogs in Europe, along with excerpts of Dr. Bertram's workshop, Construction of Terrarium Environments Suitable for Amphibians, will be available to **ISSD** members for \$20.00/VHS and \$25.00/Beta or 8mm. European VHS conversion will cost an additional

\$30.00. A limited number of last years tape from IHS #12, Poison-Dart Frog Workshop, are still available at \$15.00/VHS. Those interested should contact:

Ed Oshaben
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Chardon, Ohio, U.S.A., 44024

In an effort to keep our members informed of the Spike controversy, the following is verbatim quote of a recent Associated Press news dispatch:

COCAINE-FIGHTING PLAN ALL BUT DEAD

Washington, D.C. -AP President Bush's plan to combat cocaine at the South American source is all but dead just months after its inception, according to officials who cite turf battles among U.S. agencies, poor planning and a lack of coordination.

The plan to eradicate and intercept cocaine in Peru and Bolivia - the worlds main coca plant producers - also suffered serious setbacks because the two Andean nations are rife with corruption, lack resources and face enormous economic and political problems, the officials say. In

Peru, the largest coca leaf grower, an ambitious U.S. program has been halted because increasing guerrilla activity threatened American personnel.

South America was to have been the battleground for stopping the cocaine flow into the United States. Bush, in his presidential campaign, called for an "international strike force to hit back, quick and hard and often at foreign drug operations" to stop narcotics production at the source.

Most of the worlds coca leaves, the source of cocaine, grow in Peru's Upper Huallaga Valley, a lush region at the foothills of the Andes known as the "cocaine cradle." The sprawling region is a stronghold of leftist guerrillas known as Sendero Luminoso, or Shining Path.

U.S. efforts to operate in the region and set up Bush's strike force were halted because of the security threat, said a spokeswoman for the State Departments Bureau of

International Narcotics Matters.

Ground level eradication, already inefficient because it is done by hand, was slowed further. Aerial spraying, which would effectively stop the plant's four harvests a year, is banned by Bolivian law and repeatedly put off in Peru.

Attempts by about a dozen agents of the Drug Enforcement Administration to locate and destroy makeshift cocaine laboratories and clandestine airstrips have been curtailed by the guerrilla activity, forcing agents to move out of the region and ferry in by helicopter for day trips.

With the strike force approach stalled, DEA agents are falling back on longstanding programs of advising local authorities. They continue to train Peruvian police while work goes on in the Upper Huallaga Valley to shore up a helicopter base to offer enough security against guerrillas for American personnel to operate full time in the region.

U.S. officials still disagree on where prime responsibility for the South American drug mission should lie, with operations ranging from DEA, whose primary role is law enforcement, to the U.S. armed forces, which would go after the traffickers and growers using counterinsurgency tactics.

The CIA, noting the lack of definition, set up a Counter Narcotics Center in April to "combine operational and analytical support to our country's fight against international drug trafficking," says spokesman Bill Devine. He said the plan was to unite the intelligence community - the Federal Bureau of Investigation, the Defence Intelligence Agency, the National Security Agency, the U.S. Customs Service and the DEA.

Declining to elaborate on the mechanics of the CIA center, Devine added: "The whole idea is to prevent overlap, for everyone to read from the same book."

Bush's drug czar, William Bennett, is to issue a report in September to define the strategies for overseas and at home. A national Security Council report on "who does what" is underway, Bennett spokesman Don Hamilton said.

Beginning with the next page, you will find a copy of the paper presented by Erik Wevers to a general assembly of participants of the 13th IHS. Those of you who view the video-tape recorded by Ed Oshaben will note that the talk differs substantially from the paper. Erik chose to present his talk to a slide show. The slide show was magnificent! It was very well received by IHS participants, most of whom were not "frog people". What is lost in the printed text are the personal touches which made Erik's talk one of the highlights of the Symposium.

Keeping and Breeding *Dendrobates azureus* and some other Poison-Dart Frogs in Europe

Dear friends and colleagues; first I would like to offer you a greeting and to express my delight at being here at the 13th International Symposium. I am pleased to be here in America to tell you something of how we in Holland, Belgium, and Germany are keeping and breeding our Poison-Dart Frogs.

The keeping of Poison-Dart Frogs is a hobby that some of us in Europe have enjoyed for almost twenty-five years now. Especially in the last few years there has been a great increase in interest in these beautiful jewels of the tropical rain forests of Central and South America.

Most Europeans like to keep their frogs in rather large terrariums; the average is about 70 x 50 x 70cm (length x depth x height) (28 x 20 x 28 inches). This corresponds roughly to what you call a forty gallon-breeder size aquarium. This, of course, varies depending upon the species. In general, however, the bigger - the better.

Our terrariums always have a water pool, and if possible we like to have water falls. This is aesthetically pleasing and also it is functional, in as much as it helps to maintain a high level of humidity.

It is important that the frogs have a sense of security in their environment. Therefore, we use stones and wood quite liberally to provide hiding places for the frogs. Also we plant the terrariums with a dense growth of vegetation. In such a terrarium the frogs can feel at home, and they can move freely from hiding places to water and to dry land. Poison-Dart frogs are intolerant of stress. A well built terrarium will allow the frogs to live and thrive for many years. A terrarium that is proving itself to be successful should never be disturbed.

Similarly, frogs that are doing well in a terrarium should not be moved to a different one. In the wild, most Dart frogs live out their whole lives in one place. Moving them from a safe and secure home to another terrarium, even if the second one is likewise well constructed, is very stressful to the frogs.

Europeans generally light their terrariums about 16 hours per day. The ideal temperature for most frogs is about 25° to 27° C (77° - 81° F) in the day time and about 20° to 22° C (68° - 72° F) during the night. In a terrarium that is of the dimensions that I have already mentioned (that is, 70 x 50 x 70 cm or 28 x 20 x 28 inches) we like to keep no more than 6 animals. Most Dart-Frogs are territorial and if the population density is greater than this there will, no doubt, be stress on the animals. This, of course, varies depending upon the species being kept in the terrarium. We consider it an error to keep community terrariums. Ideally there should not be mixing of species. Community set ups may work well enough for a while, but in the long run it will be detrimental to all the species being kept together. Different species being kept together will increase their territorial defenses and this behavior is a sign of the stress that they are being subjected to. Also, it is unlikely that breeding will occur in a community terrarium. Another reason that community set-ups should be discouraged is that there is the risk of inter-breeding and it is more difficult to keep track of the blood-lines. If we are to keep our frogs in the future we must take care to maintain genetically pure populations. If things continue as they are, there is a good chance that the rain forests will be destroyed. The Dart-Frogs that survive will be the ones we keep in our terrariums! We should take great care to breed them well.

In Europe we generally feed our frogs with various species of drosophila. It is also quite popular to heavily supplement them with wild collected insects in the summer time. Most frogs will take insects up to 30 mm (0.18 inches), and a few of the larger species will take insects up to 1 cm (0.4 inches). Of course, one must take care not to collect insects from areas where insecticides have been sprayed.

Now I would like to talk more specifically about my favorite frog, *Dendrobates azureus*. I have been keeping them now for almost six years. In my opinion they

are the most beautiful of all frogs. This species originates in Surinam and it is known only from a very limited and isolated forest island on the Sipaliwini - Savannah. They are found at an elevation of 315 - 430 meters (1033 - 1411 feet). Within these forest islands they are found only in creek valleys which are littered by large moss-covered boulders, between which they live. Why they restrict themselves to this particular micro-environment is not known. In my terrariums the frogs seem to do just as well with or without the rocks. In the natural environment the daytime temperature averages 27° - 32° C (81° - 90° F), and at night it falls to about 20° C (68° F).

Dendrobates azureus has a smooth skin, the background colour of which is black. They are covered with blue spots sometimes so close together that they appear as if the pattern is actually black on blue rather than the other way around. In this sense it is rather like the Zebra - is a Zebra a white horse with black stripes or a black horse with white stripes?? Whatever it is, the result is a stunningly beautiful animal! The pattern of the markings is not consistent. I have some animals that are almost completely blue and I have others with rather large areas of black. *D. azureus* is one of the largest of the poisonous frogs. The females are larger than the males, about 4.5 cm (1.8 inches) and they are usually quite plump. The males grow to about 3.8 cm (1.5 inches). In most cases the males can be recognized by their relatively larger front feet toepads.

These frogs are very active, especially during the sprinkling of water and during the feeding time. It is maintained in the literature that the females are quite aggressive, my observations confirm this. The males are also somewhat aggressive at times. This behavior is affected by the size of the terrarium. It is not necessarily bad; with these behaviors they interact with each other to establish territories. This is important in the natural breeding relationships. However in a terrarium that is overcrowded, it can be detrimental. The call of *D. azureus* is very inconspicuous. It will not usually be noticed unless one is specifically listening carefully for it. It is a very faint low-pitched buzzing sound rather similar to the call of *Dendrobates tinctorius*.

These frogs are easy to feed. They eat almost any insects, from tiny drosophila to spiders up to 15 mm (0.6 inches) long. Reproductive activity is linked quite

recognizably to the quality and quantity of food available. In the winter I feed them with fruit-flies and I get 2 to 4 eggs once each week or two. In the summer I feed them with "pasture plankton" and I usually get 3 to 5 eggs twice per week. It has been stated, and is true, that success, in the first instance, is food dependant. Occasionally I supplement their food with a dusting of vitamins. I do this more in the winter when pasture plankton is not available. I feed the growing young frogs almost exclusively with pasture plankton when it is available. I screen the collection to select the smaller insects. This is a laborious process but as a result I realize larger and more beautiful frogs. The young frogs grow better than if they are raised on vitamin-dusted fruit-flies. In this manner I get healthy adults and, in turn, from them I get healthy baby frogs.

Dendrobates azureus do not produce many eggs. Clutches average from 2 to 5 eggs, depending upon the season. They produce the largest eggs of any of the poisonous frogs. Likewise, the tadpoles are very big. It is the male who decides where the eggs will be layed. The eggs may be deposited in a petri-dish under a coconut or on a bromiliad leaf. Both the male and the female clean the nesting site before the eggs are layed. After the eggs are layed, or sometimes during the laying of the eggs if there is enough room, the male fertilizes them. Sometimes a second male will also fertilize the eggs, and occasionally both will do so simultaneously! I leave the eggs in the terrarium until the larvae are almost ready to emerge from the eggs. The males clean and water the eggs at least every other day. In the natural habitat it is the male who transports the eggs. I have found that the eggs are less likely to mold if they are left to the care of the males. I have found that in clutches where some eggs have become mouldy, the fertilized eggs remain unaffected. The tadpoles are cared for in a special tank with thirty separate compartments. The tadpoles are cannibalistic. The water is free to circulate but the tadpoles cannot come in contact with each other. The water circulates through a biological filter beneath the tadpole compartments. The water temperature is maintained at about 22° C (72° F). Higher temperatures result in faster growth and early metamorphosis. Frogs which metamorphosize early are small and usually will not attain the same full natural size as those which develop more slowly. I feed the tadpoles with fishfood and sometimes with crushed snails. During the first few days after they emerge from the eggs, I feed the larvae with liquifry Red and

Green. The tadpole grow well on this diet so I do not use any other types of food. The incubation period from fresh fertile egg to free swimming tadpoles is from 16 to 18 days. The larger larvae can measure up to about 2 cm (0.8 inches) long. The development of the tadpoles from the time of hatching to metamorphosis take about three months and the tadpoles reach an average size of about 4 to 5 cm (1.6 - 2 inches). When the front legs emerge the tadpoles are removed to a plastic box. When the tail is completely resorbed they are removed to small terrariums which contain peat moss and leaf litter and a small water dish. The temperature is maintained at about 22° C (72° F). and the humidity is kept as high as possible. After a few weeks I raise the temperature to 25° C (77° F). The froglets are fed small arthropods, fruitflies and baby spiders. The young frogs grow very fast and become sexually mature in about one year.

It is quite likely that *Dendrobates azureus* is related to *Dendrobates tinctorius*. It is possible to cross-breed *D. azureus* with both *D. tinctorius* and *D. auratus*. I think that this practice should be discouraged because the blue frog is so rare. Rather, the genetic line should be maintained pure and guarded carefully. When available, the blue poisonous frog is not difficult to raise and to keep. However, we need to exercise good stewardship of the specimens already entrusted to us because new imports are not now, and may never again be possible!! The species is now listed as endangered and is felt to be threatened with extinction in the wild.

I thank you all for your interest and I hope that you have enjoyed the opportunity to see De Blauwe Gifkikker in all its beauty.

I am occasionally asked: what do you do with "bad" frogs? Some froglets develop with deformities and sometimes frogs develop illnesses which one knows will eventually prove fatal. Obviously one does not want to pass along genetically deficient frogs to other collectors and with the large numbers of frogs that I keep I cannot afford to keep the "bad" ones around. I euthanize them, and I do this by putting them in the freezer. I think (hope ?) that this method is painless. - Dale Bertram

Crossbreeding - To Be, Or Not To Be?

On several occasions in the past I have asked members to submit statements of their opinion in the matter of crossbreeding different species and subspecies of Dendrobatid frogs. As I have stated before, I do not think that there is any "right" answer to these questions. **ISSD** does not attempt to promote any individual philosophy, nor do we suggest any specific "policy". We feel that doing this would only stifle the debate. Rather, **ISSD** offers itself, through this newsletter, as a forum of discussion. We hope that all members will feel free to air their thoughts, and in this manner we can all become informed as to what is going on in collections throughout the world.

In response to my solicitations, two members have submitted some of their thoughts. Excerpts from those letters, as well as my own opinion follows:

Hans Zwoferink, of Holland, writes: "My opinion, an opinion which is shared by 90% of the members of the Nederlandse Doelgroep Dendrobatidae (Dutch Dendrobatid Society), is that every frog-lover has to avoid crossbreeding. There are several arguments as to why we feel this way. Firstly, in almost all cases the crossbreeds are infertile. However, I know of a man who has young frogs from a cross of *Dendrobates auratus* and *Dendrobates leucomelas*. The resulting froglets look like *auratus* but the colours are those of *leucomelas*. It may be coincidental, but the froglets have deformed front legs. In any case they sure do not look good! The owner has kept these frogs alive and is still attempting to breed them. My opinion is that this is a very bad thing to do, not only because of the problems with the front legs, but also simply because they are crossbreeds. Another argument against crossbreeding is that nobody wants to buy these animals. Last year at our first "Frog Days" there were two crossbred frogs from a *Dendrobates azureus* X *Dendrobates tinctorius* cross. Although they were beautiful, and the price was very low, nobody wanted to buy them and the owner had to take them home again. A third argument is more philosophical; Why should we try to produce a new kind of frog? There are already about 230 different types of Dendrobatid frogs. I think that should be enough for any real frog lover. Of course I know that we cannot keep all the types, and maybe it is better this way. Lets be

satisfied with the frogs there are! At last, I do not think that nature needs any help from us to compliment its wildness. Lets enjoy all the good and beautiful things of nature, but let us not try to interfere".

Godfried Van Tomme, of Belgium, writes: "In 1984 and again in 1985 I got from a male *Dendrobates leucomelas* and a female *Dendrobates auratus* (dark brown/black) about sixty F_1 hybrids. Most of them are patterned like *auratus* but are coloured like *leucomelas* (except that the yellow is not gold-yellow but more lemon yellow). In 1987, my friend Jan Meere (Den Haag - Holland) obtained, from the breeding of some of my F_1 hybrids, three beautiful F_2 hybrids. They were of the same colour as their parents. In 1988 he got some F_3 hybrids as well. I believe that this demonstrates that hybrids *auratus* X *leucomelas* are fertile in some cases.

In 1985, I obtained from an F_1 male *Dendrobates azureus* and an F_1 female *Dendrobates tinctorius* (Tafelberg) a lot of F_2 hybrids. The colour of them was not very brilliant. They were dirty blue colored, between *azureus* and *tinctorius* in colour. In 1987, I got from some of these F_2 hybrids, eleven F_3 hybrids. Three of them were *azureus* coloured, two of them were *tinctorius* coloured, and the rest were coloured like their parents".

Mr. Van Tomme does not exactly state his opinion on the matter but it is implied that he favors these experiments and that specifically he is interested in the matter of reproductive capacity of the hybrids.

My personal opinion is as follows: I believe that hybridization will occur, regardless of whose opinions are expressed, and no matter how strongly those opinions are promoted. It is out of natural curiosity that people feel compelled to want to do these things. However I believe that a discussion of the issue will stimulate people to consider what they are doing and what effect it may have on our collections in the future. Hopefully people will be encouraged to take great care with these manipulations of the natural wild bloodlines.

I am reminded of a discussion that I recently had with one of our members who is an avid keeper of tropical fish as well as frogs. He told me of how, in the past, exceedingly beautiful and highly prized turquoise colored Discus fish were produced from a cross of the natural Blue Discus and the natural Brown Discus. These fish rapidly became so popular that a great deal

of energy was devoted to their propagation, to the detriment of efforts to propagate the wild Blue variety. As a result, the Blue-Discus is now very rare in collections and also it is facing probable extinction in the wild. This should send up a RED FLAG immediately!!

I have heard rumors that recently there was a disastrous fire resulting in a significant habitat loss in the Sipaliwini-Savannah area of Surinam. This is the geographically isolated and naturally vulnerable habitat of *Dendrobates azureus* (incidentally, it is the only known habitat of this species). There is now great concern that *azureus* may be extinct in the wild! I do not know exactly what the status of this species is in Europe (it is by no means abundant), but I do know that it is exceedingly rare in the U.S.. The sum total of adult specimens in the U.S. totals less than forty. Ownership of *Dendrobates azureus* amounts, basically, to a "trust" of a very precious natural treasure. In my opinion, attempts to hybridize *azureus* with other species are totally inappropriate. At least at the present time, hybridization amounts to very poor stewardship of a precious entity. *Dendrobates azureus* is being bred, in my collection, with an eye to the future. The goal is to produce genetically pure and healthy individuals for distribution to other collectors who will themselves attempt to build up the captive gene pool.

On the other hand, *Dendrobates tinctorius* is a species which is relatively abundant both in the wild and in captive populations. I have genetically healthy and actively reproducing populations of the "cobalt blue" (Tafelberg) and the "powder blue" color phases. I do not perceive any threat to my ability to continue producing an abundance of both of these color forms in genetically pure colonies. Therefore, I have crossed them and I do not feel that there is anything wrong with doing so. The only justification that I offer is that I wanted to satisfy my curiosity. The "powder blue" color phase frogs are not really powder blue at all, at least in the sense of the light pastel blue that this term implies. They would be better described as blue-grey but the term "powder blue" is firmly entrenched and everyone knows just which color phase one has in mind when the term is used. Cobalt-blue is a fittingly descriptive term for the Tafelberg subspecies. Tafelberg X "powder blue" *tinctorius* produce offspring which have blue legs that are actually a real powder blue color. With respect to the yellow, some of the F₁ froglets have the typical wide and vivid yellow of Tafelberg while others have the narrower and more

creamy yellowish-white of the "powder blue" form. Once having made the decision to cross these subspecies one must be willing to accept the dilemma that is inherent in doing so. Namely, what is to be done with the offspring? I have limited my production of crossbred F_1 specimens to eight. I have not decided yet but I will either keep all of them myself, or I will distribute them to people whom I can trust to keep accurate records of their genetic history. I bring this up because it illustrates another point with respect to the issue of the negative impact of crossbreeding. If I were to sell a large number of crossbred *tinctorius* I could easily envision the scenario of a rapid loss of control over what ultimately will happen to them. Perhaps at some future date, say fifteen years from now, someone will purchase specimens of these real powder blue frogs, knowledge of the fact that they are actually a crossbreed have long since been lost. Possibly all that might be known about them is that the specimens were obtained from a friend who got them from a friend-of-a-friend who got them from "who knows where" at some time, somehow, someplace - maybe! Thus the stage is set for someone to offer the claim that they are actually a new and distinct color phase. This sort of thing has happened before, especially among fish keepers.

Another point of argument which urges prudent breeding is that what seems to be abundant now may be rare at some point in the future. It is a strange phenomenon that the desirability of a given species tends to be proportional to its scarcity. Consider, for example, the current situation with Hawaiian *auratus*, there are so many of them being produced that you cannot give them away. And many people seem to have the attitude that among Dart-Frogs they are the least attractive specimens. Yet if one actually looks at them critically it must be admitted that they are beautiful animals! Many breeders have stopped producing them, but in truth their "natural" wild populations in Hawaii are precarious. *Dendrobates leucomelas* were so common in Europe just a few years ago that most breeders stopped producing them, now they are relatively hard to come by. Other factors not foreseen now may influence our ability to acquire fresh stock from the wild. I submit that it would be a rather unwise thing to attempt to collect in the Huallaga Valley of Peru at the present time! The point is, if Tafelbergs, or "powder blue" *tinctorius*, or *leucomelas*, or Hawaiian *auratus* become rare someday, I will still have them in genetically pure form in my collection. This commitment to keeping pure

lines must come before any experimental crossing!

In conclusion, it is my opinion that crossbreeding is justifiable, even if it is done only to satisfy ones curiosity, if and only if the following prerequisites are met: Firstly, the species being crossed must not be endangered or threatened in the wild, and they should be abundant in captive populations. Secondly, the person doing the crossing must maintain genetically pure populations of the parent stock regardless of what happens with their hybridization experiments. Thirdly, the offspring must always be distributed with copies of all information pertaining to their genetic history and only to those breeders who will accept the responsibility to see to it that this data accompanies these frogs wherever they or their offspring go, to the n'th generation.

*"Without firing a shot,
we may kill one-fifth
of all species on this planet
in the next twenty years."*

RUSSELL TRAIN

1988



NEWSLETTER OF THE
INTERNATIONAL SOCIETY FOR THE STUDY
OF DENDROBATID FROGS

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